



**EFFECTIVENESS OF ACTIVE STRETCHING OF TIGHTENED VS WEAKEND QUADRATUS LUMBORUM MUSCLE ON ITS RANGE OF MOTION AND STRENGTH**

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**ABSTRACT**

**Background:** the purpose of this study was to assess the effect of Active stretching of tight and weak quadratus lumborum muscle.

**Method:** 56 healthy subjects were included in this study. The age between 20-50 years. Subjects were selected randomly and conveniently allocated into 2 groups (group A and B) Active stretching of tight and Weak QL. Before and after the treatment subjects were assessed and analysed with Range of motion (Lumbar side flexion and extension ) for strength QET.

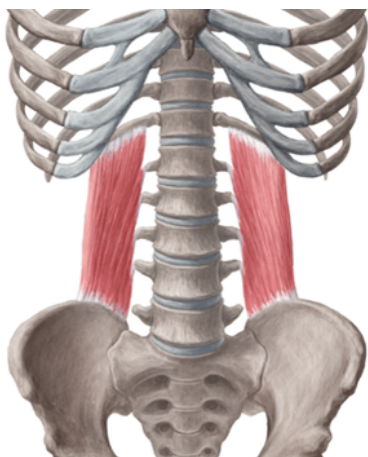
**Result:** Pre and post treatment protocol was analysed using paired t test and Unpaired t test. Unpaired t test analysis showed that ( significant effect for Lumbar side flexion  $p=0.0320$  and wasn't significant for Extension  $p=0.9330$  ) and extremely significant for QET ( $p=0.0001$ ).

**Conclusion:** The effect of active stretching of QL enhances increase in Range of motion and strength subjects with Tight and weak QL muscle.

**KEYWORDS :** Quadratus Lumborum, QET, Active stretching

**Introduction**

The word QL comes from the latin word Quadratus meaning 'Square' and Lumborum word lumbus for 'loin'. One of the posterior and deepest abdominal wall muscle is QL. According to a Study the functions of the QL muscle are a mystery, Lumbar lateral flexion and lumbar extension are two functions of QL<sup>1</sup>. According to anatomy text book QL 'probably helps to extend or may extend the lumbar spine. Also Bioengineers have stated that QL muscle is heavily active during lumbar movements including lumbar side flexion, extension and also act as hip hiker and supports ribs during inspiration<sup>1</sup>. The architecture of the quadratus lumborum appears to be consistent with the activation profiles in that the muscle is an agonist of the extensors in extending the spine but is more active than the extensors during lateral bending<sup>2</sup>. In its functional contribution the primary antagonist to each QL is QL on other side of the body and have concluded that it is an important stabilizer of the lumbar spine<sup>1</sup>. appears to be an important stabilizer of the lumbar column due to its increasing activity under pure axial loading produced during the upright standing<sup>2</sup>.

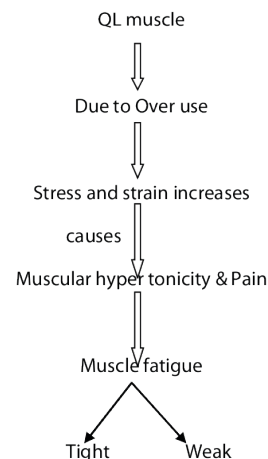


**Fig 1**

During Sitting to standing and standing to walking heavily muscle is in use and due to this reason is very common to have low back pain .

Due to Repeated bending and twisting activities ; Lifting heavy weights ; Lateral pelvic tilt (one leg is shorter) ; Abnormal sitting posture ; unsupportive mattress ; weak other muscles - gluteus medius and minimus muscle , Erector spinae , Abdominals ( core ) QL dysfunction occurs. Deep aching pain on both the sides of lower back and which will worsens when changing position from sitting to standing is the most common and pure symptom of QL muscle pain. This pain ultimately causes pain in hip joint, buttocks and thighs also pain in sacroiliac joint , low back pain, abdominal pain<sup>23</sup> .

(QL and trigger Pain) The QL muscle becomes tight and causes a deep, aching, throbbing pain A few different situations can cause QL dysfunction.



Activity that habitually involves raising one hip indicates that that side muscle is shortened or tight. Such activities include carrying a child on the hip or sitting cross-legged. Another reason that the QL muscle may become chronically tense is through overuse becomes weak<sup>4</sup>.

In modern lifestyle most of times people sit for longer period of time for eg in classroom or in the office , Majority of people don't have good sitting and standing posture or balanced core muscles. Extra heavy load placed on QL muscle which is due to weak erector spinae

muscles which are supposed to support the weight of upper body but QL which aren't designed to bear so much weight .Due to this muscle lead to Dysfunction .and also due to overuse and excessive load The muscles may fatigue, spasm and become more tight or Weak.<sup>3</sup>

Stretching is a form of physical exercise in which a specific muscle or tendon is deliberately flexed or stretched in order to improve the muscles felt elasticity and achieve comfortable muscle tone<sup>5</sup> .To improve joint range of motion (flexibility), decrease muscle tension , improve circulation, relieve muscle pain, prevent injury, and improve athletic performance these some are common aims of stretching<sup>6</sup> .

Effects of stretching are to improve range of motion ; reduces muscle - soreness, tightness, spasm ; increase muscle tone increase in muscle strength; reduces risk of injury or soreness ; reduce pain ; Lengthening of shortened muscle<sup>6,7,9</sup> .

several repetitions of the short duration stretch are most effective for increasing range of motion and flexibility of the involved segment . Proper mobility exercise will help to improve imbalance and to get long term results<sup>8</sup> . To improve strength and muscle length stretching is a common technique which is used by specialists and athletes. In the stretching programme muscle is taken to its end range and that position is maintained for certain period of time. Facilitation of golgi tendon organ is one of the advantage of stretching. To activate golgi tendon organ static tension over muscle or tendon unit is placed, due to this autogenic inhibition of the muscle that is stretched occurs. Proper mobility exercises helps to improve imbalance between the muscle and to get long term results.

**Materials and methodology**

Population: Healthy volunteers from the society willing to participate in the study were taken. The criteria for inclusion were: age between 20-50 years and decreased range of motion and QET. Subjects were excluded if they had Spinal deformity, recent abdominothoracic surgeries , recent muscular injury.

56 subjects with age (range 20-50 years, 17 males and 39 females) participated in the study, written consent form was taken. Subjects were divided into two experimental groups through random sampling with convenient allocation method. All 56 subjects received Active stretching of quadratus lumborum muscle . All the subjects were informed about the experimental protocol and risks of the study and gave written consent before their participation. The protocol and the consent form were previously approved by protocol and ethical committee.

**Measurement Procedure:**

The functional tests QET and Lumbar range of motion (Side flexion and extension) were performed.

**Quadratus lumborum Endurance Test**

QL endurance test is performed by having the subject lie on his body side supported , forearm at 90° to torso . The upper leg is crossed in front of lower leg , placing that foot in front of lower leg foot . Using the arm as a brace and providing up at the ankle , the knees and the pelvis lift off the floor and held in straight line as long as possible . This test causes 54 % of maximal voluntary contraction of Quadratus lumborum ipsilateral to down or support arm side<sup>3</sup> .

**Lumbar Range of motion**

To measure range of motion of right and left lumbar spinal flexion Goniometer is used .While the subject was standing erect, The goniometric axis was placed at approximately the level of the lumbosacral junction. The stationary arm was positioned in a line vertical to the floor, while the moving arm was aligned with the spinous process of C7<sup>4</sup>. Instruction was given to bend directly to the side, as far as possible, and the therapist recorded the range of motion in degrees<sup>5</sup> .

Spinal extension was also measured with a goniometer; The subject was standing with feet apart .On the most superior aspect of the iliac crest, aligned with the midaxillary line goniometric axis was placed. The stationary arm was positioned in a line perpendicular to the floor, while the moving arm was aligned with the mid axillary line .Instructions to the subject is to bend directly backwards, as far as possible, while maintaining full extension of the knee.at maximum end range degrees noted with gniometer<sup>5</sup> .

**Therapeutic protocol**

Sit crossed leg on the floor. Maintain your affected side leg down ( by the use of your unaffected side hand ) then Forward flexion - followed by trunk rotation- lateral flexion towards the unaffected side with your affected side arm. Then you'll Feel the stretch on the affected side.

**Statistical analysis**

The data was entered into Microsoft office excel 2010. The data was analysed using instat software. Descriptive statistics were used to analyse baseline data for demographic data. Unpaired t test was used to find the significance of parameters between pre and post-test and p value less than 0.05 was considered to be statistically significant.

56 subjects were included in the study. Protocol of one week with 28 subjects (10 males, 18 females) with tight QL in group A and 28 subjects (7 males, 21 females) with weak QL in group B, where active stretching of quadratus lumborum muscle was given. Pre analysis was done for all 56 subjects. The descriptive analysis of the study is summarized in table 1. Inter group analysis is done in table 2 and intra group analysis in table 3.

**Table 1: Descriptive characteristics of subjects in the study**

VARIABLES	MEAN ± SD	
	Group A	Group B
Age	29.64±7.78	28.82±7.48
No of subjects	28	28
No of Males	10	7
No of Females	18	21

**Table 2: Inter group analysis comparing pre and post of each group**

N= 56 (28 in each group)			Group A	Group B	P Value	T Value
Range of Motion	Lumbar Side flexion	Pre	22.75±3.03	25.96±3.29	0.0004	3.795
		Post	25.92±2.78	27.92±3.91	0.0320	0.202
	Lumbar Extension	Pre	32.14±4.92	32.53±6.13	0.7926	0.2643
		Post	34.32±4.52	34.21±4.96	0.9330	0.8445
QET		Pre	38.67±16.36	38.67±16.36	<0.0001	4.239
		Post	41.10±16.28	41.10±16.28	0.0001	4.16

Inter group analysis of all variables was done using unpaired t test. Pre interventional analysis showed significance for lumbar side flexion (p = 0.0004), and no significance for lumbar extension (p = 0.7926 ), and significant for QET(p = 4.239) between group A and group B. Post interventional analysis showed significance for lumbar side flexion (p = 0.0320) but wasn't significant for lumbar extension(p=0.9330) and extremely significant for QET(p=4.16) .

**Table 3: Intra group analysis comparing pre-pre post-post of each group**

Group A	Range of motion Lumbar		QET
	Side flexion	Extension	
Pre	22.75±3.03	32.14±4.92	38.67±16.36
Post	25.92±2.78	34.32±4.52	41.10±16.28
'p' value	< 0.0001	0.0026	<0.0001
T value	10.15	3.317	5.976

Group B	Range of motion Lumbar		QET
	Side flexion	Extension	
Pre	25.96±3.29	32.53±6.13	23.60±9.28
Post	27.92±3.91	34.21±4.96	26.53±8.77
'p' value	0.0003	<0.0001	<0.0001
T value	4.205	4.567	8.058

Intra group statistical analysis revealed extreme significance ( $p=0.0003$ ,  $<0.0001$ ,  $<0.0001$ ) between pre and post intervention for all the groups using paired t test. The result shows there is increase in range of motion, improvement in quadratus lumborum endurance test results.

### Discussion

Stretching is a common activity used by athletes, older adults, rehabilitation patients, and anyone participating in a fitness program<sup>12</sup>. The stretching used by athletes usually involves taking the Muscle-tendon unit to the end of the range of motion and holding it there for up to 1 min before relaxing and then repeating the procedure several times<sup>13</sup>. Facilitation of the GTO which may produce inhibition of the muscle that is stretched occurs due to slow static stretch<sup>9</sup>. Stretching Affects the biomechanical properties of muscle by increase in muscle-tendon unit length. 'Stress relaxation' response is When tissues are held at a constant length, the force at that length gradually declines<sup>6</sup>. Immediate increase in ROM after stretching is called as 'Creep'. Some studies suggests that stretching improves muscle strength, power, and endurance, as well as the efficiency of exercise<sup>6</sup>.

Manual stretching is better than conventional passive stretching because it showed certain improvements in flexibility and length & decrease in muscle strength and also psychological positive changes<sup>7-14</sup>. In this study also due to manual stretching there is improvements in muscle length flexibility after stretching intervention but also there is increase in strength of muscle.

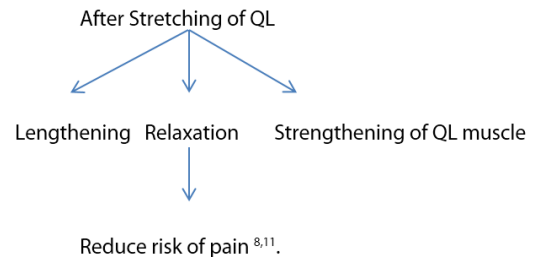
Immediately after stretching due involvement of physical properties of muscle there is decrease in elasticity of muscle connective tissue (increase in extensibility) as a acute change which is stated in previous studies<sup>14</sup> and increase in muscle fiber length<sup>14</sup>. Also some studies stated that the sarcomeres as well as tendon and muscle belly were stretched<sup>14</sup>. According to a studies, Immediately after stretching as a acute change there is increase in muscle length and decrease in muscle strength<sup>14</sup>. Muscle strength may decrease after stretching due to elongation of sarcomere, muscle belly or tendon. but in this study there is significant increase in strength, also some studies suggest that there may be increase in muscle strength because of increased circulation in muscle or decrease in muscle tension<sup>5</sup>.

Some studies suggests that Effectiveness depending upon length of stretching program of stretching technique, With dose of (<20 sec) for week cannot show any significant improvements according to a study<sup>7</sup>, but in above study Active manual stretching of QL was given for 1 week every day 3 times with (20 – 30) sec hold<sup>9,10</sup>.

There are only few research are present on the QET test. To challenge QL muscle of abdominal wall to enhance spinal stability and as a strength test side bridge ( QET ) has been documented<sup>9</sup>. Maximum 54% voluntary contraction QL muscle of ipsilateral to the down or support side arm due to this test. Researchers found that QET is reliable in strength testing of QL muscle<sup>3</sup>. In some studies shoulder pain was most common complaint which was faced<sup>3,4</sup>. Also in this study, there was little difficulty while doing this test because of its position and also shoulder pain was found in 3 individuals. There is no significant effect of handedness age or job activity on QET<sup>3,4</sup>. According to previous studies normal QET values are in women (72 – 77 Sec) and in men (81 – 84 sec). But in above study mean QET was (mean 38.67 sec) which is very less as compare to normal. & Normal Lumbar side flexion (25.3 - 38.7; Extension ( 27.4 - 41.2) in age group between 20-50<sup>5,11</sup>.

Study as a comparison between Tight and Weak sides of QL. According to two studies the decreased endurance times of QL, is because of muscle hyper tonicity can result in fatigue<sup>3,4</sup>. Due to pain muscular hyper tonicity may develop<sup>3</sup>. To avoid compromising performance and an increased risk of musculoskeletal disorders complete relaxation of low back muscles is necessary<sup>11</sup>. So after stretching intervention Muscle lengthening as well as strengthening occurs due to this relaxation of QL occurs & ultimately it will reduce risk of back pain.<sup>7</sup>

In this study, occurrence of QL dysfunction is more in females than male.



The study was carried out and the result was drawn by using ROM and QET as the outcome measures. 56 patients (17 Males and 39 Females), out of which 26 were Right and 30 were Left side affected, diagnosed as tight or weak QL. The age Group was between 20-50 years. Study place was Krishna College of medical sciences, Karad. Subjects were evaluated and were divided into two Groups by Simple random sampling with Convenient allocation method. 28 subjects were included in Group A and group B accordingly and treated with Active stretching of QL muscle.

In this study an attempt was made to analyse the effect of Active manual stretching of QL muscle in improving functional status, ROM, strength and Quality of life among adult age between (20 – 50). This study was done to investigate the improvement in ROM & Strength after Active manual stretching of QL and its post treatment evaluation in a standardized manner using Goniometer for ROM and QET for strength. The result shows extremely significant improvement in group A (Active stretching of tight QL muscle) as compared to group B (Active stretching weak QL muscle).

In Group A (Tight QL muscle) after intervention of stretching there is extremely significant increase in lumbar side flexion and significant increase in extension also strength of QL muscle significantly increased.

In group B (Weak QL muscle) after intervention of stretching there is significant increase in ROM (lumbar side-flexion, extension) and very significant increase or no increase in some individuals.

The result of current study shows that Active manual stretching of tight QL muscle has extremely significant effect over Active manual stretching of weak QL muscle among adult by both statistically and clinically.

### Abbreviations –

QET – Quadratus lumborum endurance test

QL – Quadratus lumborum

ROM – Range of motion

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